

## **FOREST INSECT AND DISEASE CONDITIONS**

**in the**

**Intermountain Region**

**1998**

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\*\*If the appendices are not included in this document, they can be obtained under separate cover from the Internet at [www.fs.fed.us/r4/health/cond98fm.htm](http://www.fs.fed.us/r4/health/cond98fm.htm) or from the Boise Field Office at the address on page iii.

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## **INTRODUCTION**

This report summarizes the status of forest insect and disease activity in the Intermountain Region (Region 4), comprising parts of Idaho, Utah, Nevada, Wyoming and California. Insect status is based largely on aerial detection surveys conducted over approximately 23,650,000 acres of forested lands in 1998. Disease status is based largely on ground observations and surveys. General insect and disease information is summarized in the Summary of Conditions.

The Special Project Update summarizes on-going studies conducted by Forest Health Protection in cooperation with other Regions, Forest Service Research, and universities.

Recent publications are listed to assist the reader in locating recent pest information of interest.

Two appendices include various tables and figures. Acres surveyed by administrative area during 1998 are summarized in Table 1. Numbers of trees killed by major bark beetles and affected acres are displayed in Tables 2 through 9. Figure 1 depicts the relative number of trees killed by bark beetles in Region 4 between 1981 and 1998. Figure 2 depicts acres defoliated by Douglas-fir tussock moth and western spruce budworm in Region 4 between 1960 and 1998. Figure 3 displays the areas aerially surveyed in the Region during 1998. General location of major insect activity is shown in Figures 4 through 7.

If the appendices are not included in this document, they can be obtained under separate cover from the Internet at [www.fs.fed.us/r4/health/cond98fm.htm](http://www.fs.fed.us/r4/health/cond98fm.htm) or from the Boise Field Office at the address on page iii.

## **Summary of Conditions**

Tree mortality attributed to mountain pine beetle decreased throughout the Region with 11,000 dying trees observed in 1998 compared to 33,000 trees in 1997. The largest outbreaks in the Region were located on the Sawtooth National Forest in southern Idaho in lodgepole pine, on the Dixie National Forest in southern Utah in ponderosa pine, and on the Bridger-Teton National Forest in western Wyoming in lodgepole pine. Elsewhere in the Region smaller mountain

pine beetle outbreaks were located on all National Forests except the Toiyabe National Forest in western Nevada.

Mortality of whitebark and limber pine attributed to mountain pine beetle attack decreased with 3,200 trees killed in 1998 compared to 6,100 trees in 1997. Greatest mortality was located in Utah and Idaho.

Scattered ponderosa pine mortality caused by the roundheaded pine beetle was observed on the Dixie and Manti-LaSal National Forests in southern Utah. This mortality was sometimes intermixed with mountain pine beetle activity.

Jeffrey pine beetle caused tree mortality again declined significantly on the Toiyabe National Forest and adjacent Federal, State and private lands in Tahoe Basin with only 400 dead trees recorded.

Spruce beetle mortality increased from 1997 levels with 105,500 dead trees observed in 1998 compared to 70,700 in 1997. This increase was predicted in 1997 due to the large amount of green infested trees in southern Utah which were not visible during the 1997 aerial survey. The largest infestations were located in Utah where 42,900 trees were killed on the Dixie National Forest and 48,900 trees were killed on the Manti-LaSal National Forest. Mortality was also observed on the Fishlake, Uinta, and Wasatch Cache National Forests. No significant mortality was observed in southern Idaho or western Wyoming.

Douglas-fir beetle mortality increased in Idaho and Wyoming and remained static in Utah. In 1998, 31,300 trees were killed compared to 21,700 trees in 1997. In southern Idaho the largest outbreaks were located on the Payette and Caribou National Forests. Elsewhere activity was observed on the Sawtooth, Boise, Salmon-Challis, and Targhee National Forests. In Utah the largest outbreaks were located on the Ashley and Manti-LaSal National Forests with other smaller outbreaks located on the Dixie, Fishlake, Uinta, and Wasatch-Cache National Forests. Mortality on the Bridger-Teton National Forest in western Wyoming increased threefold to 3,600 trees in 1998.

Only small isolated infestations of western pine beetle and pine engraver beetle were recorded in 1998. All western pine beetle activity was located in southern Idaho while populations of pine engraver beetle were found in southern Idaho and in slash of ponderosa and lodgepole pine in Utah.

A significant decline in subalpine fir mortality attributed to a complex of insect and disease factors was observed throughout host type in 1998 with only 13,200 trees killed compared to 133,000 trees in 1997. During 1997 most of the subalpine fir mortality was located on Utah National Forests while in 1998 most mortality was observed on Idaho, Nevada and Wyoming National Forests.

Fir engraver beetle caused tree mortality decreased significantly in 1998 with only 2,600 trees killed compared to 22,600 trees killed in 1997. The largest area of beetle activity was observed on the Toiyabe National Forest and on Federal, State and private lands in the Tahoe Basin Management area. No significant mortality was observed in southern Idaho, Utah or western Wyoming.

For the fifth consecutive year gamble oak (*Quercus gambelii*) was defoliated by the fall cankerworm in Utah. In 1998 a significant increase in defoliation occurred along the Wasatch Front in northern Utah from Spanish Fork to Brigham City. Approximately 34,200 acres were defoliated in 1998 compared to 4,900 acres in 1997.

Along the Wasatch Front in Utah, 916 acres of Federal, state and private lands were treated with *Bacillus thuringiensis* (Bt) for European gypsy moth eradication. This was a cooperative project with the Utah Department of Agriculture. Treatment is one aspect of the integrated pest management approach along with egg mass surveys, gypsy moth trapping, education, and quarantine, if necessary.

Foliage diseases were epidemic in *Populus* species throughout the Region. Leaf damage was observed in central and eastern Idaho; northern Utah; and western Wyoming. In southern Idaho incidence of larch needle disease declined and damage was frequently overshadowed by larch defoliation caused by the larch casebearer.

## **Status of Insects**

### **Insects: native**

#### **Defoliators**

##### **Douglas-fir tussock moth *Orgyia pseudotsugata***

Location: Idaho, Nevada, Utah  
Host: Douglas-fir, True firs

No visible defoliation from Douglas-fir tussock moth was observed in the Region during 1998. Pheromone bait trap catches indicated increasing populations in

the Owyhee Mountains and in the Weiser and Council Ranger Districts on the Payette National Forest.

### **Western spruce budworm *Choristoneura occidentalis***

Location: Idaho, Utah, Wyoming

Host: Douglas-fir, True firs

Approximately 19,500 acres of light defoliation was observed on the Cedar City, Escalante and Teasdale Ranger Districts of the Dixie National Forest in Southern Utah. This is the first recorded defoliation in the Region since 1987.

### **Pine Needle Miner *Coleotechnites sp.***

Location: Idaho, Utah, Nevada

Host: Ponderosa pine

Approximately 600 acres of ponderosa pine in all size classes were discolored by this needleminer on the Emmett Ranger District on the Boise National Forest. An additional 75 acres of discolored ponderosa pine was noted in the Flaming Gorge National Recreation Area in Utah. Scattered discoloration was also mapped on the Pine Valley Ranger District of the Dixie National Forest In Utah.

## **Bark beetles**

### **Douglas-fir beetle *Dendroctonus pseudotsugae***

Location: Idaho, Utah, Wyoming

Host: Douglas-fir

Mortality increased in Idaho and Wyoming and remained static in Utah. In 1998 31,300 trees were killed compared to 21,700 trees in 1997. Outbreaks were located on the Sawtooth, Boise, Salmon-Challis, Caribou, Targhee and Payette National Forests in southern Idaho. In Utah outbreaks were located on the Manti-LaSal, Ashley, Dixie, Fishlake, Uinta, and Wasatch-Cache National Forests. Mortality on the Bridger-Teton National Forest in western Wyoming increased from 900 trees in 1997 to 3,600 trees in 1998.

### **Fir engraver beetle *Scolytus ventralis***

Location: California, Idaho, Nevada, Utah

Host: Grand fir, Red fir, Subalpine fir, White fir

Mortality again decreased significantly in 1998 with only 2,600 trees killed compared to 22,600 trees killed in 1997. The largest area of beetle activity, with approximately 1,500 dead trees was located on the Toiyabe National Forest and on Federal, State and private lands in the Tahoe Basin Management Area. Approximately 600 dying trees were observed on the Humboldt National Forest in Nevada. No significant mortality was observed in southern Idaho. Mortality remained low in Utah totaling 500 dead trees on the Dixie and Fishlake National Forests.

#### **Jeffrey pine beetle *Dendroctonus jefferyi***

Location: California, Nevada

Host: Jeffrey pine

Jeffrey pine beetle activity remained static on the Toiyabe National Forest and Tahoe Basin Management area with 400 trees killed in 1998.

#### **Mountain pine beetle *Dendroctonus ponderosae***

Location: Idaho, Nevada, Utah, Wyoming

Host: Limber, Lodgepole, Jeffrey, Ponderosa, Whitebark pines

Mountain pine beetle-caused mortality decreased from 35,000 trees in 1997 to 11,000 trees in 1998. The largest outbreaks in the Region were located on the Sawtooth National Forest in southern Idaho in lodgepole pine with 2,000 trees killed; on the Dixie National Forest in southern Utah in ponderosa pine with 2,200 trees killed; and on the Bridger-Teton National Forest in western Wyoming in lodgepole pine with 2,000 trees killed. Elsewhere in the Region smaller mountain pine beetle outbreaks were located on all National Forests except the Toiyabe National Forest.

Mortality of whitebark and limber pine attributed to mountain pine beetle attack decreased with 3,200 trees killed in 1998 compared to 6,100 trees in 1997. Most of the mortality was located in Utah and Idaho with 900 and 1,200 trees killed respectively.

#### **Pine engraver beetle *Ips pini***

Location: Idaho, Nevada, Utah

Host: Lodgepole, Ponderosa pine

Mortality due to pine engraver beetle remained low throughout the Region. Activity is often associated with western pine beetle. In Utah, populations were found in slash of ponderosa and lodgepole pine.

### **Roundheaded pine beetle *Dendroctonus adjunctus***

Location: Utah

Host: Ponderosa pine

Ponderosa pine mortality attributed to this beetle continues to occur in scattered areas on the Dixie and Manti-LaSal National Forests in southern Utah.

### **Spruce beetle *Dendroctonus rufipennis***

Location: Idaho, Utah, Wyoming

Host: Spruce

Spruce beetle mortality increased from 1997 levels with 105,500 trees dead Regionwide compared to 70,700 in 1997. The largest infestations were observed in Utah, where 42,900 trees were killed on the Dixie National Forest and 48,900 trees were killed on the Manti-LaSal National Forest. Mortality was also observed on the Fishlake, Uinta, and Wasatch Cache National Forests. No significant mortality was observed in southern Idaho National Forests or on the Bridger-Teton National Forest in western Wyoming.

### **Western pine beetle *Dendroctonus brevicomis***

Location: Idaho

Host: Ponderosa pine

Only small isolated infestations of western pine beetle were recorded in 1998. Pine engraver beetle activity was frequently associated with western pine beetle infestation.

### **Others**

#### **Cooley spruce gall adelgid *Adelges cooleyi***

Location: Idaho, Utah, Wyoming

Host: Spruce, Douglas-fir

This adelgid was found in forested stands and ornamental trees throughout the Region; impact is greatest on ornamental blue spruce trees. On Douglas-fir, the

alternative host, infested needles often develop a yellow spot and twist at the point of attack.

**Fall cankerworm** *Alsophila pometaria*

Location: Utah

Host: Gamble oak

A significant increase in defoliation on gamble oak (*Quercus gambelii*) occurred along the Wasatch Front in northern Utah from Spanish Fork to Brigham City. Approximately 34,200 acres were defoliated in 1998 compared to 4,900 acres in 1997. This is the fifth consecutive year of this defoliation.

**Lodgepole terminal weevil** *Pissodes terminelis*

Location: Utah

Host: Lodgepole pine

Heavy populations of this weevil were observed along the north slope of the Uinta Mountain range. Damage was heaviest on the Evanston and Mountain View Ranger Districts on the Wasatch-Cache National Forest.

**Pine Sawflies** *Neodiprion* sp.

Location: Idaho

Host: Ponderosa Pine

Defoliation of ponderosa pine caused by a sawfly was detected throughout the Little Weiser river drainage on the Payette National Forest. Scattered pockets of defoliation were observed on ornamental trees along the Wasatch Front in Utah.

**Sagebrush leaf beetle** *Trirhabda* sp.

Location: Idaho

Host: Sagebrush

Heavy defoliation of sagebrush caused by a leaf beetle was detected in rangeland south of Twin Falls, Idaho.

**Sagebrush Defoliator** *Aroga websteri*

Location: Utah

Host: Sagebrush

This sagebrush defoliator caused extensive damage on private property in northeastern Utah. Defoliation was especially heavy in wet sites.

**Sequoia pitch moth** *Synanthedon sequoiae*

Location: Nevada

Host: Lodgepole, Ponderosa pine

Localized populations are found on the east side of the Sierras, on the Toiyabe National Forest.

**Xyelid sawfly** *Xyella* sp.

Location: Idaho

Host Ponderosa Pine

Localized populations of this sawfly were detected feeding on pine pollen in the Boise River drainage on the Boise National Forest.

**Insects: non-native**

**European gypsy moth** *Lymantria dispar*

Location: Idaho, Nevada, Utah

Host: Various deciduous species

The gypsy moth was first detected in Utah in 1988. Between 1989 and 1993 approximately 72,000 acres of Federal, State, and private lands were treated with *Bacillus thuringiensis* (Bt). In 1995, after two years of intensive trapping resulting in no moth captures, the gypsy moth was declared eradicated.

In 1997, 46 moths were captured in Salt Lake City and one moth on the Wasatch-Cache National Forest. In 1998 the Utah Department of Agriculture, in

cooperation with the USDA Forest Service, treated of 801 acres of private lands and 115 acres of Federal lands (Little Cottonwood Canyon). No moths were captured in Little Cottonwood Canyon and the moth catches on private lands were reduced to 21 moths. Eleven single moths were caught in other areas along the Wasatch Front.

Seven hundred and sixty-four acres are scheduled for treatment in 1999, in the Knudsens Corner area and trapping will be significantly intensified along the Wasatch Front to further characterize the nature of any reinfestations. Treatment will be one aspect of the integrated pest management approach along with gypsy moth trapping, egg mass surveys, education, and quarantine, if necessary.

#### **European Pine Shoot Moth *Rhyciona buoliana***

Location: Idaho

Host: Ornamental pines

This exotic shoot moth was found infesting ornamental pines in many counties in southwest Idaho. Severely infested trees developed deformities such as bushy appearance, spike tops and fork tops.

#### **Poplar-and-willow borer *Cryptorhynchus lapathi***

Location: Idaho

Host: Willow

The larvae of this weevil are defoliating and causing stem mortality of Scouler willow southeastern Idaho.

### **Status of Diseases**

#### **Diseases: native**

##### **Stem and Branch Diseases**

###### **Aspen trunk rot *Phellinus tremulae***

Location: Idaho, Nevada, Utah, Wyoming

Host: Aspen

Decay occurs in most aspen stands in the Region and is increasingly common as aspen stands exceed 80 years of age.

**Comandra blister rust** *Cronartium comandae*

Location: Idaho, Utah, Wyoming, Nevada

Host: Lodgepole, Ponderosa pine

Infection occurs infrequently throughout Idaho and Wyoming. Heavy, localized areas of infection resulting in branch, top, and entire tree mortality of sapling-size ponderosa pines occurs in offsite plantations in southern Idaho. In Wyoming and northern Utah, infection frequently occurs on lodgepole pine in localized pockets.

**Cytospora canker of true firs** *Cytospora abietis*

Location: Idaho, Utah, Nevada, Wyoming

Host: True firs

Branch flagging, top-killing, and mortality attributed to this fungus occurs wherever host is found. This disease is associated with environmental stress damage, drought, frost, and freezing. Western balsam bark beetle frequently kills the diseased trees.

**Dwarf mistletoes** *Arceuthobium* spp

Host: Douglas-fir, Pines, Western Larch

Location: Idaho, Nevada, Utah, Wyoming

Suppression projects continue to remove infected overstory trees; however this forest disease remains the most widespread and frequently observed disease within the Intermountain Region. Regional incidence by major host species is estimated as follows: lodgepole pine 50 percent, ponderosa pine 20 percent, and Douglas-fir 20 percent infected. These numbers represent the percentage of host stands having some level of infection.

**Limb rust** *Peridermium filamentosum*

Location: Utah

Host: Ponderosa pine

Infection causing branch mortality and occasional tree mortality occurs in all size classes of trees on the Dixie National Forest in southern Utah.

**Pinyon blister rust** *Cronartium occidentale*

Location: Idaho, Utah  
Host: Pinyon pine

This disease occurs in the Raft River Mountains on the Sawtooth National Forest, Idaho.

### **Red ring rot *Phellinus pini***

Location: Idaho, Nevada, Utah, Wyoming  
Host: Douglas-fir, Pines, Spruce, Western Larch

Infection intensity varies throughout stands in the Region.

### **Rust-red stringy rot *Echinodontium tinctorium***

Location: Idaho, Nevada, Utah  
Host: Grand fir, Subalpine fir, White fir

Decay caused by this fungus is common in mature and overmature stands of true firs.

### **Stalactiform blister rust *Cronartium coleosporioides***

Location: Idaho, Nevada, Utah  
Host: Lodgepole pine, ponderosa pine, Jeffrey pine

This rust occurs in localized areas throughout the host type. Heavy infection has been noted in very localized areas on the Boise, Payette, Sawtooth, and Challis National Forests in Idaho.

### **True mistletoe on Juniper *Phoradendron juniperinum***

Location: Nevada, Utah  
Host: Junipers

Occuring throughout the pinyon-juniper forest type in Utah and Nevada, this disease spreads and intensifies slowly and is therefore more common in older stands.

### **Western gall rust *Endocronartium harknessii***

Location: Idaho, Utah, Wyoming, Nevada  
Host: Lodgepole, Ponderosa pine, Jeffrey pine

Gall rust occurs throughout the host types. Infection levels vary, with localized heavy infection present in both host species.

### **Other stem decays: *Cryptoporus volvatus*, *Fomitopsis officinalis*, *Laetiporus sulphureus***

Location: Idaho, Nevada, Utah, Wyoming  
Host: Various conifers

A large number of minor stem decay agents, too numerous to list, occur with varying intensity throughout the Region.

## **Root Diseases**

### **Annosus root disease *Heterobasidion annosum***

Location: California, Idaho, Nevada, Utah, Wyoming  
Host: Bitterbrush, Chokecherry, Douglas-fir, Jeffrey pine, Lodgepole pine, Ponderosa pine, Spruce, True firs

This root disease fungus can be found throughout the Region, but mostly as a decay organism. The fungus is occasionally damaging to young, planted stands of ponderosa pine on droughty soils.

### **Armillaria root disease *Armillaria* spp.**

Location: Idaho, Nevada, Utah, Wyoming  
Host: Douglas-fir, Grand fir, Pines, Spruce, Subalpine fir

Evidence of Armillaria root disease can be found throughout the Region functioning primarily as a weak pathogen or saprophyte causing little direct mortality. In southern Utah, it may act as a primary pathogen, killing mature and immature ponderosa pine and mature fir and spruce.

#### **Black stain root disease *Ophiostoma wageneri***

Location: Idaho, Nevada, Utah  
Host: Pinyon pine

This fungus causes mortality of pinyon pine on the Bureau of Land Management Burley District in Idaho, on the Humboldt and Toiyabe National Forests in Nevada, and on the Dixie and Manti-LaSal National Forests in Utah.

#### **Schweinitzii butt rot *Phaeolus schweinitzii***

Location: Idaho  
Host: Douglas-fir, Spruce, Ponderosa pine

Decay is common in mature and overmature forests throughout the host type, especially those with a frequent fire or logging history. The fungus is often associated with other root pathogens and bark beetle activity. Trees are seldom killed directly as a result of infection.

#### **Tomentosus root disease *Inonotus tomentosus***

Location: Idaho, Utah  
Host: Douglas-fir, Spruce, Subalpine fir

This fungus is found alone or associated with *Phaeolus schweinitzii* and *Armillaria* spp. It causes root and butt rot of pole-sized and larger trees, predisposing them to bark beetle attack and windthrow. In southern Utah, it kills spruce in progressively enlarging disease centers.

#### **White mottled rot *Ganoderma applanatum***

Location: Idaho, Nevada, Utah, Wyoming  
Host: Aspen

This pathogen is increasing in incidence throughout the Region. The disease can be found on windthrown aspen on the Dixie, Wasatch-Cache, and Fishlake National Forests in Utah; Humboldt National Forest in Nevada; and Caribou and Sawtooth National Forest in Idaho.

### **Status of Foliage Diseases Native**

#### **Cedar apple rust *Gymnosporangium* sp.**

Location: Idaho

Host: Apple, Serviceberry

In eastern Idaho, this disease caused by an unknown species of *Gymnosporangium*, caused a leaf spot to *Amelanchier* throughout the range of serviceberry in eastern Idaho.

#### **Conifer - Aspen rust, Conifer - Cottonwood rust *Melampsora medusae*, *Melampsora occidentalis***

Location: Idaho

Host: Aspen, Conifers, Cottonwood

Epidemic throughout the host range of all *Populus* species. During 1998 occurrence was light due to late frost competition with other foliage diseases.

#### **Douglas-fir needle cast *Rhabdoctline* spp.**

Location: Idaho, Wyoming

Host: Douglas-fir

Incidence was light with infection noted throughout the range of Douglas-fir in southern Idaho and western Wyoming.

#### **Elytroderma disease *Elytroderma deformans***

Location: Idaho

Host: Ponderosa pine

Systemic and annual infections occur throughout the host type.

**Fir broom rust** *Melampsorella caryophyllacearum*

Location: Idaho, Nevada, Utah, Wyoming  
Host: Subalpine fir

Infections occur throughout the host's range. Infection intensity varies significantly, but is common in stands south of the Snake River in Idaho.

**Fir needle cast** *Lirula* spp.

Location: Idaho  
Host: Grand fir, Subalpine fir

Infection is at endemic levels throughout the host type.

**Fir needle rust** *Pucciniastrum epilobii*

Location: Idaho, Wyoming  
Host: Subalpine fir

Scattered infection occurs on seedling and sapling size trees throughout the host type.

**Incense cedar broom rust** *Gymnosporangium libocedri*

Location: California, Nevada  
Host: Incense cedar

This disease occurs in isolated patches of host trees on the Toiyabe National Forest.

**Larch needle diseases** *Meria laricis*, *Hypodermella laricis*

Location: Idaho  
Host: Western larch

Incidence and severity of infection in west central Idaho is cyclical. In 1998, these diseases were overshadowed by larch defoliation caused by the larch casebearer.

**Lodgepole pine needle cast** *Lophodermella concolor*

Location: Idaho  
Host: Lodgepole pine

Infection intensity is worse following periods of drought. During intervening years, the disease is of minor localized importance.

**Marssonina blight** *Marssonina populi*

Location: Idaho, Utah, Wyoming  
Host: Aspen

The disease again was epidemic in central and eastern Idaho; northern Utah; and western Wyoming. Affected trees had brown colored foliage from mid-July until leaf drop.

**Pine needle rust** *Colesporium* spp.

Location: Idaho  
Host: Lodgepole, Ponderosa pine

Scattered incidence of light to moderate intensity occurred scattered throughout the host types in southern Idaho.

**Spruce broom rust** *Chrysomyxa arctostaphylii*

Location: Idaho, Utah, Nevada, Wyoming  
Host: Englemann spruce

Scattered infections occurred throughout the host type, especially in eastern Idaho and in localized pockets on the Fishlake National Forest, Utah.

**Diseases: non-native**

### **White pine blister rust *Cronartium ribicola***

Location: Idaho, Wyoming, Nevada

Host: Limber, Whitebark, Bristlecone, Western white, Sugar pines

This introduced disease is common throughout its host ranges in southern Idaho and western Wyoming. It is present in the western portion of Nevada.

### **Declines/Complexes**

#### **Subalpine fir Mortality Complex**

*Dryocetes confusus*, *Pityophthorus* sp., *Pityokeines* sp., *Crypturgus* sp., *Scolytus* sp., *Heterobasidion annosus*, *Armillaria* sp., *Cytospora abietis*, *Melampsorella caryophyllacearum*

Location: Idaho, Nevada, Utah, Wyoming

Host: Subalpine fir

Subalpine fir decline and mortality continues to occur throughout host type in the Region. Ground examinations suggest a complex of factors are involved in this mortality. These factors include: twig beetles, secondary bark beetles, wood borers, engraver beetles, root diseases, cankers, rusts, and environmental conditions.

A significant decline in mortality was observed throughout host type in 1998 with only 13,200 trees killed compared to 133,00 trees in 1997. During 1997 most mortality was located on Utah National Forests while in 1998 most mortality was located on Idaho, Nevada and Wyoming National Forests.

### **Nursery Insects and Diseases**

#### **Fusarium root disease *Fusarium oxysporum***

Location: Idaho, Utah

Host: Douglas-fir, Ponderosa pine, Spruce, True firs

This disease causes low levels of mortality primarily of 1-0 conifer seedlings at the Lucky Peak Nursery, Boise National Forest, Idaho and the Lone Peak Nursery in Utah.

### **Phytophthora/Pythium root rot *Phytophthora* spp., *Pythium* spp.**

Location: Idaho, Utah

Host: Douglas-fir, Spruce

These fungi occur infrequently on seedlings and in soil at the Lucky Peak Nursery, Boise National Forest, Idaho, and the Lone Peak Nursery in Utah. Infection results in patch mortality and culling of 2-0 seedlings.

## **SPECIAL PROJECT UPDATE**

**Fire Survival Plots** Fire survival plots were installed in 1995 in six areas burned during 1994 wildfires on the Payette National Forest. These areas were selected because they represented underburn conditions in Douglas-fir, grand fir, and subalpine fir habitat types. The objective of this study is to develop criteria which would accurately classify trees expected to die as a result of fire injury. These plots were again monitored in 1998. Contact: Julie Weatherby

**Permanent Plots to Validate Forest Disease Models** This is an ongoing project to establish permanent plots to aid in the validation of disease models including the dwarf mistletoe model, the western root disease model, as well as models for comandra blister rust and limb rust. These plots were installed in forests containing ponderosa pine, lodgepole pine, and Douglas-fir dwarf mistletoes. Contact: John Guyon.

**Thinning Second Growth Ponderosa Pine as a Management Strategy for Western Pine Beetle** Evaluation of an investigation on the Idaho City Ranger District, Boise National Forest, continues to determine if differences exist in tree mortality among stands of second growth ponderosa pine thinned to two different densities and an unthinned check stand in the presence of western pine beetle infestation. Plots were monitored in 1998. Contact: Ralph Thier

**White Pine Blister Rust Survey of the Intermountain Region** A three year study was completed in 1997 to investigate the current distribution of white pine blister rust in the Intermountain Region. Whitebark, limber and bristlecone pines are hosts to the disease. Overall blister rust is widespread in southern Idaho and western Wyoming. It was not found in northern Nevada or northern Utah. A final report was prepared. Contact: Jim Hoffman

**Biological Control for Noxious Weed Management** These projects involve

coordination with federal agencies, multi-state agencies, counties, universities, and private individuals in collecting and exchanging biological agents to conduct operational and insectary releases for the management of noxious weeds. Information, new technologies, and educational materials are developed and shared in a collaborative stewardship approach to this growing problem. Contact: Tom Barbouletos

**Leafy Spurge Special Technology Development Project.** The field work for this project has been completed. Most of the infestation has been mapped, site characteristics have been delineated, agent populations have been monitored and a study to determine the impact of released agents has been completed. Analysis of the data continues and a report will be completed this spring. Contact: Tom Barbouletos.

**Tools and Information for Predicting and Monitoring Spruce Beetle**

**Populations** Plots monitoring phloem temperatures of infested Englemann spruce trees and associated insect development were initially installed on the Dixie and Wasatch-Cache National Forests in 1997. A variety of phloem temperature based parameters are being examined for strength of correlation (predictive power) with life cycle duration. Preliminary results indicate that average temperature for the larval growing season (July-Sept.) has a strong correlation with voltinism. Lab experiments to determine lifestage specific, temperature dependent development and threshholds are scheduled to begin in April 1999. Data from this study, in conjunction with the field data, will be used to develop a phenology model and classification rule for predicting one year versus two year populations. Contact: Steve Munson.

**Factors Influencing Spruce Beetle Population Dynamics and Silvicultural**

**Implications for Spruce Beetle Management** Study sites were established on the Manti-LaSal National Forest to monitor seasonal availability of downed host material. The objective is to determine whether spruce beetle colonization, brood production, and larval survival differ with respect to the time of year downed host material is produced. Study pairs of Englemann spruce were selected and dropped, one in the fall of 1996 and the other in the spring of 1997 before beetle flight. All trees were visited in late July-August of 1997 to record attacks on each host. In the spring of 1998 and 1999 trees will be sampled to quantify the number of emerging adults. Contact: Steve Munson

**Mountain Pine Beetle Susceptibility/Risk Rating in Southwestern Ponderosa Pine** A logistic regression model has been developed that

uses stand attributes and a measure of current beetle activity to predict probability of tree mortality within a stand (Chojnacky, in review). Additional analysis of the field data is ongoing, testing the use of regression trees to identify statistically significant parameters for susceptibility or risk, including parameters of host clumpiness. The discriminatory power of a susceptibility or risk model will be increased if all trees within a stand have been challenged by beetles and if the sequence of tree mortality is known. Forty-five permanent plot sites will be monitored on a two to three year interval to record new infested trees. Once the outbreak sequence is observed, the data will be used to validate the existing risk model. This is a collaborative effort among FHP staff in Regions 2, 3, and 4, and RWU 4501 in the Rocky Mountain Research Station. Contact: Steve Munson.

**Spruce Beetle Suppression Study** A spruce beetle suppression project was developed on the Logan Ranger District, Wasatch-Cache National Forest to evaluate the use of multiple treatment tactics. Three trap clusters of pheromone traps baited with the component attractant for spruce beetle, trap trees and sanitation treatments were used to suppress a localized population of spruce beetle on the T.W. Daniel Experimental Forest. The Experimental Forest is administered jointly by Utah State University and the Forest Service. A portion of the School Forest used pheromone traps and trap trees exclusively to suppress beetle populations. Data analysis has been completed and a research paper has been drafted that summarizes the effects of the various treatment strategies. Participants in the study include RWU 4501 - Rocky Mountain Station and FHP, Ogden Field Office staff. Contact: Steve Munson.

**Spruce Beetle Management Strategies** Permanent plots are being installed on the Fishlake National Forest to evaluate density management strategies for reducing spruce beetle impacts to Englemann spruce. The objective of the study is to prevent spruce beetle outbreaks and reduce their impacts using density management strategies, and improve silvicultural guidelines for the prevention and suppression of spruce beetles outbreaks. The plots are being established in stands that are between 150 -500 acres over an area of several thousand acres in total. Lands involved include National Forest, State and private. A study of this scope allows results to be applicable to large geographic areas and varied ownership with monitoring over long periods of time. A portion of the plots were installed in 1998 and the remainder are scheduled for installation in 1999. Contact: John Anhold, Steve Munson .

**Bacillus thuringiensis var. kurstaki Fingerprinting** In response to the growing concern about the environmental effects of broad spectrum synthetic chemical insecticides, biological control insecticides, such as *Bacillus thuringiensis* var. *Kurstaki* (Btk), a study was designed to develop

methods to screen, identify, and differentiate between applied and native biological materials. The objective of this study is to determine if Cellular Fatty Acid (CFA) analysis using gas chromatography can be used to identify and differentiate microbial CFA's and fingerprint various Btk and Bti preparations at the species and subspecies level. Preliminary results from the Center of Bioremediation at Weber State University indicate fingerprinting can be done on commercial preparations and stock Btk samples. Additional testing and analysis will continue in 1999. Contact: John Anhold.

**Documenting Biodiversity of Non-Target Arthropods along the Wasatch Front** The Carnegie Museum of Natural History started this work in 1997 to document the biodiversity of non-target arthropods potentially affected by spraying of microbial insecticides during gypsy moth eradication projects on the Wasatch-Cache and Uinta National Forests, Utah. In 1998 sampling was done to directly assess non-target impacts at two sites where eradication efforts were undertaken. Also, the sampling extended the faunistic coverage of the two year inventory into habitats different than those sampled in 1997, primarily at lower and higher elevations. Sample preparation, analysis and reporting will be completed in 1999. Contact: John Anhold.

**Douglas-fir Modeling** In 1997 and 1998 plots were established in Douglas-fir stands on the Wasatch-Cache and Manti-LaSal National Forests, Utah, to develop a spatial model of Douglas-fir basal area as a predictor of Douglas-fir beetle caused mortality. The study sampled the spatial distribution of Douglas-fir beetle impacted stands. If the spatial distribution of Douglas-fir basal area can be correlated with actual mortality caused by the Douglas-fir beetle then sampling protocols will be developed that could be used to rate stands in their susceptibility to damage by sampling the spatial distribution of Douglas-fir basal area. Data analysis and manuscript preparation in 1999. Contact: John Anhold, Steve Munson.

## RECENT PUBLICATIONS

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**Haverty, M., P. Shea, J. Hoffman, J. Wenz, and K. Gibson. 1998.** Effectiveness of Esfenvalerate, Cyfluthrin, and Carbaryl in Protecting Individual Lodgepole Pines and Ponderosa Pines from Attack by *Dendroctonus* spp. Research Paper PSW-RP-237. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 12p.

**Knapp, A., A. Disperati, and M. Hoppus. 1997.** Evaluation of a color infrared digital camera system for forest health protection applications in the western United States and southern Brazil. *In:* proceedings, First North American symposium on small format aerial photography, Clouquet, MN, p. 217.

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**Weatherby, J., J. Roberts, S. Donnelly, K. Ogle, and G. Jacobsen, 1997** Simulated

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